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ABSTRACT

The Dental Diagnostic Simulation (DDS) System provides an alternative to simulation systems which represent diagnostic case studies of relatively limited scope. It may be used to generate simulated case studies in all of the dental specialty areas with case materials progressing through the gamut of the diagnostic process. The generation of a functional diagnostic case study by the DDS System requires relatively little effort on the part of either a case author or the CAI staff. Any case thus generated exhibits two major areas of emphasis: the gathering of information about the "patient" and his or her dental problem, and the student's submission of diagnoses pertinent to the case. (VT)

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DDS: THE DENTAL DIAGNOSTIC SIMULATION SYSTEM

by

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DDS: THE DENTAL DIAGNOSTIC SIMULATION SYSTEM

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Introduction

Accurate diagnoses of pathological conditions may be considered the essence of the contribution health professionals provide to society. The obvious application of this process is the subsequent treatment of these conditions. In this sense, dental education, as with education in the other health sciences, should concern itself, in a high priority manner, with instruction of its students in both the process of diagnosis in general and the substance of particular diagnoses with regard to specific cases. Despite the fact that such instruction is of utmost priority, in practice only relatively limited amounts of diagnostic experience may be gained in typical dental education programs. A number of reasons contribute to this situation. Harless, et al. (1971) and Christopher and Wilson (1975), have identified many of these. One of the primary reasons, however, is simply the fact that students in dental school are subject to the "luck of the draw" in most instances as far as which patients will be assigned to them. Although serving a necessary function, this is not an ideal situation and does not necessarily allow for a wide variety of good instructional cases upon which to broaden the students' diagnostic abilities.

A computer-based case simulation system is a viable attempt at a solution to this problem. In such a system, prime instructional cases may be developed by faculty and then experienced by all students in a deliberate fashion, not only by those who, by chance, would have been assigned patients with such maladies. Certain schools of medicine and veterinary medicine have developed such systems to present instructionally significant case studies to their respective students (Harless, et al. 1971; Christopher and Wilson, 1975). Although dentistry has also joined in the attempt to solve the problem by producing certain computer-based simulated diagnostic materials (e.g., Cassidy, et al., 1972; Mullaney, et al., 1973), these have been somewhat speciality specific or, at least, single case specific. That is, these simulations typically represent diagnostic case studies of relatively limited scope for specific instructional application. If additional simulated cases are desired regardless of speciality area, in effect new course material must be written, coded for computer presentation, and then input into the

computer system. DDS, the Dental Diagnostic Simulation System, provides an alternative to systems such as these in the sense that it may be used to generate simulated case studies in all of the dental specialty areas with case materials progressing through the gamut of the diagnostic process.

The development of DDS was founded upon four general objectives. The first was to develop a computer-based dental diagnostic system that would be applicable to all specialties of dentistry and which would allow the student the opportunity to experience the diagnostic process in a structured, yet self-controlled fashion for the most part. Secondly, because of the problems of faculty time and long-term motivation, it was an objective to develop a system which would require a minimum of effort by an author to produce a basic, diagnostic case study. By "basic" is meant a computer-based program which would represent the fundamental structure or skeleton of a simulated case, yet one which would be both entirely functional and instructionally valuable to the student. Thirdly, it was a purpose to establish a system that had a basic structure, as has been indicated, but was flexible enough to allow for the varied interests and emphases of case authors, and for the distinctive instructional properties of each case. And lastly, it was the objective to produce a system which would require minimal programming effort by the CAI staff to generate the code necessary to operationalize a case. The rationale for this objective rests simply in the fact that the School maintains a small CAI staff.

DDS was developed for use on an IBM 370/115-2 computer system and was written primarily in the Coursewriter III, Version 3 interactive language for delivery on IBM 3277 display stations. In addition, two system functions were written in assembler language and are called into use through Coursewriter III capabilities. These system functions serve the purpose of storing and retrieving a multitude of information about each case which would not be possible under the limited direct storage facilities (i.e., counters, switches, etc.) of the Coursewriter III system.

Structure

Any case which has been generated by DDS exhibits two major areas of emphasis. The first is that given to the gathering of information about the "patient" and his/her dental problem(s) while the second is concerned with the student's submission of diagnoses pertinent to the case. Each of these general areas is subdivided into more specific units as follows:

Information Gathering

History of Chief Complaint
Personal Profile
Extraoral Examination
Intraoral Examination
Medical/Dental History
and Follow-Up
Diagnostic Tests
(e.g., percussion,
microbiologic, etc.)

Diagnosis

Psychological Evaluation
Medical Conditions
Regarding/Affecting
Dental Management of
Patient
Home Care Evaluation
Diagnosis of Oral Le-
sions/Conditions
Periodontal Problems
Diagnosis of General
Conditions of the
Teeth
Diagnosis of Conditions/
Lesions of the Jaws
Diagnosis of Conditions
Affecting Individual
Teeth
Diagnosis of Occlusion-
Related Conditions
Diagnosis of Ill-Defined
Conditions/Diseases

Included in these various Information Gathering and Diagnosis units are approximately 700 distinct categories of information that may be requested or diagnoses that may be rendered. Student interaction with the system in supplying or retrieving particular pieces of information is accomplished in large part through coded numbers. These numbers and the information/diagnoses to which they correspond are contained in the DDS Console Booklet.

In general, case materials are organized and presented under the umbrella of a registered CAI "course". Within this "course", there exist the actual cases that would be available to the student. Materials for each of these cases are established primarily* through the use of course macros**.

*Materials common to all cases and necessary for their execution are not generated by macros, but exist in a separate course and are copied into the "course" of cases. It is necessary that this copying process be done only once per such "course".

**A macro is a facility which will allow the generation of frequently used course statements. Each macro provides a different framework of statements that ultimately generates course materials, the particular nature of which may be tailored to a case by the specification of certain parameter values to be used by the respective macros.

The process described above results in a skeletal structure of a case, the exact nature of which will have been determined by information supplied by the case author and then used in conjunction with the macros. It should be emphasized that despite the fact that this produce represents only a skeletal framework of a case, it is entirely functional at this point without the necessity of any additional computer programming. Moreover, the generated product also includes limited feedback both about the desirability of information sought or tests requested, and the appropriateness of diagnoses made by the potential student user relative to the case in question. Each of the diagnosis units also furnishes an evaluation of student performance following its completion. If further interactions with the student are desired by the author, instructional "flesh" may be added to the existing structure using traditional CAI programming methods.

Even though DDS is considerably structured, there is a certain degree of flexibility afforded the author in developing a case using this system. A fundamental aspect of flexibility is provided by DDS simply by allowing both for a broad range of information that may be retrieved and a multitude of diagnoses, representing all dental specialty areas, that may be considered. Thus, authors are able to present case studies reflecting a wide variety of instructional emphases using a common mechanism. In addition, an author also has the option of excluding or by-passing any informational or diagnosis unit or, alternatively, simply providing a summary of information that would have been available from that unit. This is accomplished by not generating the macros in question or by generating only small portions of them. And, as before stated, supplemental instructional programming which is tailored to the particular character of a case is always a viable option.

In summary, the generation of a functional diagnostic case study by the DDS System requires relatively little effort both on the part of a case author and the CAI staff. As far as an author would be concerned, he need only supply the pertinent information relative to the units of the Information Gathering section and the correct, incorrect but plausible, and completely incorrect diagnoses for each of the units of the Diagnosis section in order to produce a basic case study. (This information, of course, is in addition to ancillary material regarding the case such as completed dental charts, pertinent X-rays, etc.) With this in hand, it is necessary only for a CAI staff member to convert these data into macro parameter values and subsequently generate the respective macros. To further ease this developmental process, author and programmer workbooks have been established.

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